REPORT NO. 81-2-3

3430
OCTOBER 1980

BIOLOGICAL EVALUATION OF DIEBACK CONDITIONS ON SHORTLEAF PINE IN STUART SEED ORCHARD

by

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ABSTRACT

A 100 percent examination for dieback on the Louisiana shortleaf pine seed source in the Stuart Seed Orchard was conducted. Of 574 trees examined, 308 had stem attacks by coneworm larvae, Dioryctria spp., and 103 of these trees had top dieback. Ninety-one trees had more than 5 coneworm larvae stem attacks per tree and top dieback. Four trees were found to have pitch canker, caused by the fungus Fusarium moniliforme var. subglutinans.

INTRODUCTION

In March 1980, FIDM assistance was requested in evaluating the cause of top dieback in the Louisiana shortleaf seed source in the Stuart Seed Orchard at Pollock, Louisiana. This source consists of two 5-acre blocks of shortleaf pine; one sprayed twice this year for coneworms (Dioryctria spp.) with Guthion 2S (24 pints/100 gals. of water applied by mist blower at a rate of 2 gallons per tree) and the other unsprayed. While top dieback was observed on 10-15 trees, no determination of the causal agent was made as few samples could be taken because trees were too tall to reach with pole pruners and the soil was too wet to permit bucket truck entry.

In April more favorable conditions permitted sampling from a bucket truck. Samples of dying tops were collected from 10 trees in both blocks and were examined for insects or diseases. A few dead trees were noted, with only Ips beetles as an obvious possible cause of mortality.

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Examination of the samples for insects yielded pissodes weevils (Pissodes nemorensis Fermar.), Ips beetles (Ips spp.), small bark beetles (Pityophthorus spp.) and coneworm larvae (Dioryctria spp.). Of the insects, only the coneworm larvae had caused enough damage (by girdling stems) to be a possible factor in the top dieback (Plate 1).

Though only three of ten samples showed evidence of the pitch canker disease, caused by the fungus Fusarium moniliforme var. subglutinans Wr. and Reink., all samples were cultured on standard Fusarium agar. Only two of the samples appeared positive, and confirmation by Penn State University showed that only 1 was the pitch canker fungus. Because of the lack of observable resin soaking and the low frequency of isolation, the pitch canker fungus was not considered responsible for most of the top dieback.

In June the seed orchard manager notified FIDM that several trees had died and that many trees had top dieback (Plate 2). In order to determine the cause and severity of the problem, a biological evaluation was conducted by Ralph Miller, Neil Overgaard, Huey Wallace, and Mike Connor.

METHODS

A 100 percent survey of the Louisiana shortleaf pine source was conducted in early July. A bucket truck was used to permit close examination of the crowns and to facilitate sample collection. All trees were examined for the presence of: 1) dieback, 2) pitch canker, 3) Dioryctria spp. stem attacks, 4) Ips spp. beetles, 5) black turpentine beetles, 6) mechanical damage, 7) and other insects.

Trees that had top dieback were checked for Nantucket pine tip moth (Rhyacionia frustrana Comstock) attack, resin soaking produced by pitch canker fungus, and Dioryctria spp. attack. If neither insect presence nor damage was found, samples were taken to the laboratory and cultures for disease organisms were made on standard Fusarium agar. After 7 days incubation, fungal colonies were transferred to fresh agar plates and incubated for 14 days. Cultures were examined for the pitch canker fungus, F. moniliforme var. subglutinans. Cultures that appeared positive for the fungus were then confirmed by Dr. William Pawuk of the Southern Forest Experiment Station.

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RESULTS

The condition of the 574 trees in the two blocks is summarized in Table 1. Thirty-two percent of the trees that had Dioryctria stem attacks (Plate 3) were in the sprayed block, while 22% of the trees that had Dioryctria stem attacks were in the unsprayed block.

Although 54% of the total number of trees in both blocks had Dioryctria attacks, only 103 of the trees (19%) also showed signs of top dieback. If we narrow our consideration to the 308 trees with Dioryctria stem

Plate 1. A coneworm larval (Dioryctria spp.) gallery girdling the stem of a Louisiana shortleaf pine at the Stuart Seed Orchard.

Plate 2. Top dieback of Louisiana shortleaf pine caused by coneworm larvae (Dioryctria spp.) stem attacks at the Stuart Seed Orchard.

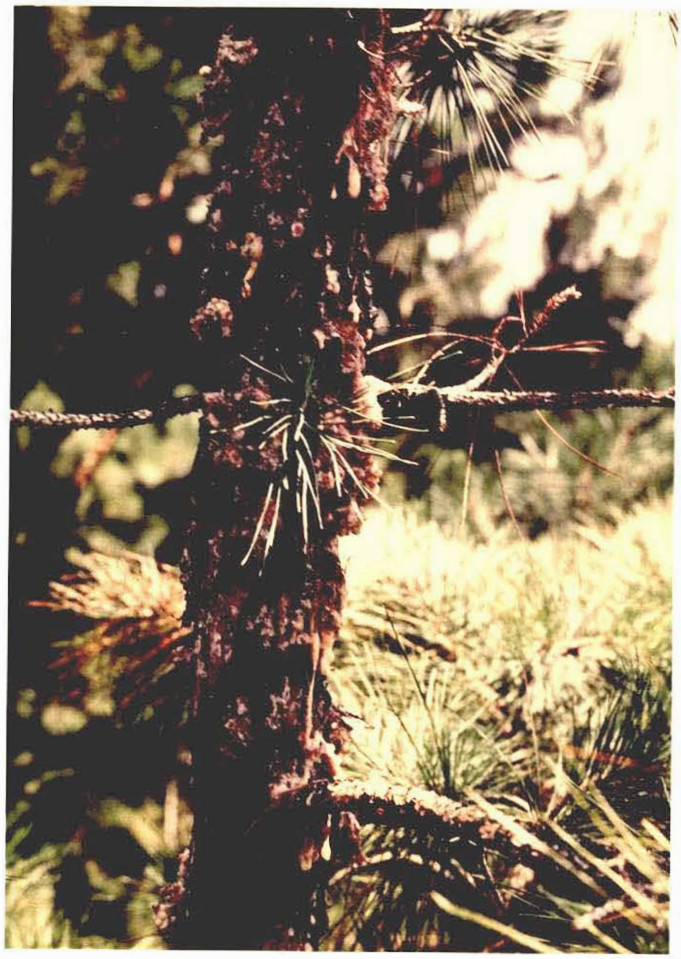

Plate 3. Coneworm larvae (Dioryctria spp.) stem attacks in the crown of a Louisiana shortleaf pine at the Stuart Seed Orchard.

Table 1. Damage found during examination of the Louisiana shortleaf pine seed source, Stuart Seed Orchard, July 1980

		Top Dieback	No Top Dieback	Total Trees
Block 1*	Trees with Dioryctria attacks	64	120	184
	> 5 Dioryctria stem attacks/tree	60	41	101
	< 5 Dioryctria stem attacks/tree	4	79	83
	No Dioryctria stem attacks	11	123	134
	Sub Total	75	243	318
Block 2	Trees with Dioryctria attacks	44	80	124
	> 5 Dioryctria stem attacks/tree	31	25	56
	< 5 Dioryctria stem attacks/tree	13	55	68
	No Dioryctria stem attacks	9	123	132
	Sub Total	53	203	256
	Total Trees	128	446	574

*Sprayed twice for coneworm control with Guthion 2S (24 pts/100 gal. water applied by mist blower at a rate of 2 gallons per tree)

attacks. We find that 35% of the infested trees had top dieback. Twenty trees (15%) had top dieback without Dioryctria stem attacks being evident. Four of these were positive for F. moniliforme var. subglutinans, 4 had damage caused by Ips beetles, and 12 showed mechanical injury or other damage.

DISCUSSION

Since top dieback occurred in 35% of the trees with Dioryctria stem attacks, it appears that the amount of dieback may be related to Dioryctria larva feeding concentrated in the upper stem of the trees. Furthermore, 51% of the trees in blocks #1 and #2 that contained Dioryctria stem attacks had more than 5 stem attacks per tree. Fifty-eight percent of the trees with 5 or more stem attacks per tree also had top dieback. Whereas only 11% of the trees in blocks #1 and #2 with less than 5 stem attacks per tree had top dieback. The incidence of top dieback was 5.3 times greater in trees with 5 or more Dioryctria stem attacks per tree than in trees with less than 5 stem attacks per tree.

This indicates that more than 5 Dioryctria attacks per stem may produce enough damage to cause top dieback of the infested tree. It is interesting to note that a total of 66 trees in blocks #1 and #2 had more than 5 Dioryctria stem attacks per tree but did not show signs of top dieback. Since there was a much higher incidence of top dieback in the trees with 5 or more Dioryctria stem attacks per tree, we could expect several more trees that are curretnly infested with Dioryctria to develop top dieback.

Of final note is that block #1 was sprayed for coneworms with Guthion 2S but still had 58% of the trees infested with coneworm, while block #2 was not sprayed and had coneworm attacks in 48% of the trees. Also, 20 of the infested trees in block #1 and top dieback while only 17% of the trees in block #2 showed signs of top dieback. There was 25% more top dieback in the sprayed block than in the unsprayed block. Possible explanations for the lack of effective control of coneworm stem attacks in the sprayed block may be mortality of non-target natural enemies, application equipment and/or technique, concentration of insecticide, type of insecticide applied, or timing of insecticide spray application.

Other insects such as Pissodes sp. weevils and small bark beetles were found attacking some of the weakened tops. Trees were under further stress by drought and several of the less vigorous trees had been attacked and killed by Ips engraver beetles. In the survey, 4 trees were found with Ips beetles; indicating a potential problem.

Field diagnosis for pitch canker proved to be a reliable method for detecting the disease. Over 100 trees were sampled and cultures made for fungal determination, confirming only four instances of the disease. Field diagnosis indentified five suspect trees of which four were diseased. The possibility of pitch canker being responsible for the top dieback was ruled out based on the low frequency of isolation.

RECOMMENDATIONS

Spraying tree boles for coneworm attack is not recommended at this time. Close surveillance should be maintained to detect trees turning yellow or red from Ips beetle attack. Trees that are infested by Ips beetles should be cut, bucked and sprayed with one (1.0) percent lindane in water [1 gal. lindane (20% E.C.) to 20 gal. water] applied to all bark surfaces to the point of run off by hydraulic sprayer. Another alternative is to remove infested trees from the orchard. The bark of these trees should be thoroughly charred if preventing beetle emergence and probable spread to adjacent pine trees is of concern.